[logo] CC ~~ARE 0715-400-10.2~~ 0715-450-759 Interoffice Memorandum

To: Mr. G. Sneddon

Copies To: Mr. G. Greer

File Water Balance

File Reference:

Date: August 18, 1977

From: Mack Barber

Department: Construction/Engineering

Location: Taft Plant

Subject: Water Balance - Conda Plant

I reviewed with the Conda Plant personnel the rise in the cooling pond level over the past seven months.

It is evident that the repairs in the gypsum pond liners have decreased the loss of pond water into the ground to a point where an imbalance in the cooling pond cycle exists. The cooling pond level is approaching a point where a cooling pond dike failure will occur.

An examination of water balances prepared by the plant indicate five major streams of well water input into the cooling water circuit. These are:

1. Vacuum pump seal water.
2. Boiler feed water treatment system regeneration.
3. Sulfuric Acid dilution water treatment system regeneration. 0715-450-753
4. Sulfuric Acid cooling basin makeup.
5. Ammonia cooling tower makeup. 0715-450-759

The plant has already developed a scheme for reusing the vacuum pump seal water stream as makeup for the sulfuric acid cooling basins. This scheme should be implemented as soon as possible.

Two additional input streams can be reduced or eliminated.

1. The use of treated water for sulfuric acid dilution and cooling in the phosphoric acid plant could be eliminated by installation of a vacuum cooler utilizing pond water for sulfuric acid dilution. Process design, equipment sizing and a general lost estimate has been done by H. K. Sepehri-Nik. The Conda Plant is presently evaluating the installation and updating the cost estimate for that plant.

Two major drawbacks of this modification are high capital investment and increased pond water requirements. An AFE will be prepared by the plant for evaluation.

2. The high boiler feed water treatment regeneration water input into the cooling pond circuit is caused by reducing the condensate return to the sulfuric acid boilers. Some condensate is lost due to leaking traps and valves, but the major part not returned to the boilers is used for filter and line washing in the phosphoric acid plant.

Gary Greer and his people are aware of the problem and have instituted programs to minimize condensate loss and use.

I strongly recommend that we immediately implement a strict ban on condensate usage for washing. Substitution of heated well water for condensate will accomplish the same rapid dissolution of buildup in the piping. At the same time it will reduce well water input into the cooling pond circuit, since approximately three gallons of regeneration water are required for each gallon of boiler feed water required. The high cost of boiler feed water treatment will be reduced proportionately.

A wash water tank with steam coils for heating will have to be installed for heating the wash water. I am certain that the expenditure for the system will show a very short payout on reduced water treatment costs. The plant people have indicated that they already have a coil available from a previous installation. An added side benefit will be increased condensate return from heating the water, during periods when the excess steam available exceeds the capacity of the steam condenser.

I recommend that the necessary AFE's be prepared for review as soon as possible. If we go into the winter months with the present cooling pond imbalance, we will be faced with a water disposal problem for which there is no known solution.

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PRESENT SITUATION - The Ammonia Plant drainage system is designed to collect the wastewater from the Ammonia Plant area and pump it to the cooling pond. At present the # 2 gypsum pond - cooling pond system is receiving about 600 gallons per minute excess water which is causing the level in these ponds to rise. These ponds already have very high water levels in them. It is necessary for continued and efficient operation of the chemical plant that the cooling pond - gypsum pond system be brought into water balance.

PROPOSED SOLUTION - This proposal is for a system that would divert usable portions of regeneration wastewater in the Ammonia Plant and use this water for cooling tower makeup. The total water savings will be about 25 gallons per minute.

PROPOSED DESIGN - Automatically timed 3-way valves will split out all of the back wash and the last 20% of the fast rinse from all of the demineralizer units at the Ammonia Plant. This split-out water will be piped to a tank from which the water will be fed to the cooling tower. The tank will be equipped with a pH monitor and a conductivity monitor.

COST SAVINGS:

WAC Water Saved = 25 gpm = 36,000 gal/day

WAC Water Cost (Basis = Sulfuric Acid @ 18.80/ton) = $.069/1000 gal.

36,000 gal/day x .069/1000 gal. = $2.48/day

2.48/day x 350 working days/year = $868/year

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JUSTIFICATION STATEMENT

PRESENT SITUATION - Wastewater from regeneration of the demineralizer units at the sulfuric acid plants is pumped to the gypsum-cooling pond system. These ponds are receiving about 600 gallons per minute excess water. Therefore, the water levels in these ponds are rising and are already at a level which is undesirably high. It willlbe necessary to reduce the quantity of wastewater going to the gypsum and cooling ponds by 600 gallons per minute to keep them from filling up.

PROPOSED SOLUTION - Selected portions of the wastewater from the regeneration cycles of the demineralizer units at the sulfuric acid plants will be cut out and piped to the cooling basins as makeup water. This water will replace about 100 gallons per minute of W.A.C. treated makeup water. This will reduce wastewater discharge from the sulfuric acid plants by about 100 gallons per minute.

COST SAVINGS:

W.A.C. water saved 100 gpm x 60 x 24 = 144,000 gal/day

W.A.C. cost per regeneration H_2SO_4 acid 2556 lbs
.85 ¢ per lb = $21.73

6 hr cycle x 800 gpm x 60 = 288,000 gal/cycle

W.A.C. water cost $21.73 x 1000 ÷ 288,000 gal/cycle = $.075/1000 gal

Daily Savings = $.075/1000 gal x 144,000 gal/day = $10.80/day = $3780/year

Based on P_2O_5 Conversion Cost

$$\text{Increased Conversion} = \frac{100\ \text{gpm}}{1610\ \text{gpm}} \times .005 = 3.1 \times 10^{-4}$$

$$\text{Ground Rock Savings} = 3.359\ \frac{\text{tons GR}}{\text{Ton } P_2O_5 \text{ acid}} \left(1 - \frac{1}{1.00031}\right) \times$$
$16.05/ton GR x 757 tons P_2O_5/day = $12.65/day

$$\text{Sulfuric Acid Savings} = 2.257\ \frac{\text{tons } H_2SO_4}{\text{ton } P_2O_5} \left(1 - \frac{1}{1.00031}\right) \times$$
$18.80/ton H_2SO_4 x 757 tons P_2O_5/day = $9.96/day

$$P_2O_5 \text{ Conversion Cost Savings} = \$22.07/\text{ton } P_2O_5 \left(1 - \frac{1}{1.00031}\right) 757\ \frac{\text{tons } P_2O_5}{\text{day}} = \$6.84/\text{day}$$

Total P_2O_5 Cost Savings = $29.45/day
Yearly = $10,308

Total Yearly Gross Savings =	$14,088
Less Annual Maint. 24,310 x .05 =	1,216
Net Yearly Savings Before Taxes	12,872
Less 48% Taxes	6,179
Savings After Taxes	6,693
Tax Savings from Depreciation (24,310 ÷ 8) x .48 =	1,459
Net Savings After Taxes	8,152